

Hiroto KOBUKUN et al. 10/501,121  
Page 12

Dkt. 1141/72716

**Amendments to the Drawings**

The replacement sheet of drawings attached hereto as **Exhibit A** includes changes to, and replace, Figure 1 of the original sheets of drawings. The descriptions of elements 7d and 7f have been amended to be consistent with the specification.

Attachment: replacement sheet for Fig. 1

Hiroto KOBUKUN et al. 10/501,121  
Page 13

Dkt. 1141/72716

REMARKS

The application has been reviewed in light of the Office Action dated March 13, 2007. Claims 1-19 are pending. By this Amendment, claims 1-19 have been amended to place the claims in better form for examination, without narrowing a scope of the claims. Accordingly, claims 1-19 are presented for reconsideration, with claims 1 and 15 being in independent form.

The specification and abstract were objected to as having informalities. The drawings were objected to as purportedly failing to comply with 37 C.F.R.1.84 (p)(4).

The specification, abstract and drawings have been reviewed and amended to correct the formal matters noted in the Office Action.

The replacement sheet of drawings attached hereto as Exhibit A includes changes to, and replace, Figure 1 of the original sheets of drawings. The descriptions of elements 7d and 7f have been amended to be consistent with the specification.

Withdrawal of the objections to the specification, abstract and drawings is respectfully requested.

Claims 1-19 were objected to as having informalities.

By this Amendment, claims 1-19 have been amended to place the claims in better form for examination, without narrowing a scope of the claims.

Withdrawal of the objection to the claims is respectfully requested.

Claims 1-5 were rejected under 35 U.S.C. § 102(b) as purportedly anticipated by U.S. Patent No. 5,832,051 to Lutz. Claims 1-19 were rejected under 35 U.S.C. & 102(e) as purportedly anticipated by U.S. Patent No. 6,381,487 to Flohr.

Applicant has carefully considered the Examiner's comments and the cited art, and

Hiroto KOBUKUN et al. 10/501,121  
Page 14

Dkt. 1141/72716

respectfully submits that independent claims 1 and 15 are patentable over the cited art, for at least the following reasons.

This application relates to various improvements devised by applicant for X-ray CT (computed tomography) imaging to acquire an image in the same time phase of a cyclic motion of an imaging subject, such as a heart and the like. In general, in a CT examination of a heart, motion artifacts caused by a heartbeat appear in a tomographic image, which are undesirable for purposes of diagnosis. For example, one improved device devised by applicant includes detecting a static cardiac time phase with a small amount of motion artifacts in a predetermined portion of the subject based on heartbeat information acquired in association with the projection data, and generating a tomographic image by reconstructing projection data corresponding to the detected static cardiac time phase. Each of independent claims 1 and 15 addresses these features, as well as additional features.

The cited art simply does not disclose or suggest such an approach.

Lutz, as understood by Applicant, proposes an approach for using a CT apparatus to examine individual cardiac phases of a patient, wherein an X-ray beam is rotated around and penetrates the heart of a patient from various angular positions, and the cardiac rhythm of the patient is determined in order to set the rotation time of the X-ray beam around the patient and to produce various control signals synchronized to the cardiac rhythm of the patient, so that radiological exposures of various cardiac phases are possible for the duration of a measurement interval.

Lutz, contrary to the contention in the Office Action, does not teach or suggest detecting a static cardiac time phase with a small amount of motion artifacts in a predetermined

Hiroto KOBUKUN et al. 10/501,121  
Page 15

Dkt. 1141/72716

portion of the subject based on heartbeat information acquired in association with the projection data, and generating a tomographic image by reconstructing projection data corresponding to the detected static cardiac time phase, as provided by the subject matter of claim 1.

Lutz, column 2, lines 25-30 and 52-58, which was cited in the Office Action, states as follows:

... A trigger signal containing trigger impulses is generated, which is synchronized with the cardiac rhythm of the patient. *Predetermined* control signals for the examination of various cardiac phases are generated chronologically displaced in relation to the trigger pulses of the trigger signal. ...

... By the *predetermined* emission of several control signals for one a trigger pulse of the trigger signal, which pulse is synchronized to the cardiac rhythm of the patient, projections of various cardiac phases can be exposed in one rotation of the X-ray beam about the patient, with the duration of the measurement interval being substantially the same for all cardiac phases.

The approach proposed by Lutz is based on the premise that the heart cycle of a patient begins with an R-wave and continues until the next R-wave occurs, and projection data is obtained by emanating the X-ray beam based on the R-wave.

The static cardiac time phase varies depending on patient to be imaged and on health condition of the patient. The approach devised by applicant enables one to more accurately set the static cardiac time phase and reduce an amount of motion artifacts, by detecting the static cardiac time phase, which varies depending on the patient to be imaged and on the health condition of the patient, based on heartbeat information.

Lutz merely proposes irradiating the X-ray beam after a predetermined time passed from occurrence of the R-wave, and such an approach cannot set accurately the static cardiac time phase which varies depending on the patient to be imaged and on the health condition of the

Hiroto KOBUKUN et al. 10/501,121  
Page 16

Dkt. 1141/72716

patient.

Flohr, as understood by Applicant, proposes an approach for producing CT images of a body region, such as the heart, which periodically moves with resting and motion phases, wherein data corresponding to a number of projections are analyzed to determine whether each projection was acquired during a resting or motion phase, and only those data that were acquired during a resting phase are employed for image reconstruction.

Lutz, column 2, lines 13-35, which was cited in the Office Action, states as follows:

The above object is achieved in accordance with the principles of the present invention in a method and an apparatus for producing CT images of a body region which periodically moves with resting and motion phases, wherein an x-ray source focus is moved around the body of the subject under examination for registering data used for producing the CT images, and wherein a number of projections are registered, during at least one revolution of the x-ray source focus around the subject, preferably, and during a time duration that is at least equal to a cycle of the movement of the body region, and wherein *the projection data are analyzed directly to determine whether the data were acquired during a resting phase or a motion phase, and wherein only those data are employed for image reconstruction that were found to be acquired during a resting phase.*

The inventive method is thus an automatic method wherein the registered measured data are patient-specifically classified by analysis of the measured data themselves to determine whether they are usable, i.e. were acquired during a resting phase of the heart, or are unusable, i.e. were acquired during a motion phase, with only measured data acquired during a resting phase of the heart being utilized for the image reconstruction. ..

Flohr, like Lutz, does not teach or suggest, however, detecting a static cardiac time phase with a small amount of motion artifacts in a predetermined portion of the subject based on heartbeat information acquired in association with the projection data, and generating a tomographic image by reconstructing projection data corresponding to the detected static cardiac time phase, as provided by the subject matter of claim 1.

Flohr merely proposes defining the resting phase of the heart using a complementary

Hiroto KOBUKUN et al. 10/501,121  
Page 17

Dkt. 1141/72716

error criterion for the projection data acquired without heartbeat information.

Flohr does not disclose or suggest "detecting a static cardiac time phase with a small amount of motion artifacts in a predetermined portion of the subject *based on heartbeat information*", as provided by the claimed subject matter of the present application. As pointed out in the application, the subject matter embodies the recognition that the static cardiac time phase varies depending on the heart rate. The claimed subject matter of the present application enables one to more accurately set the static cardiac time phase and reduce an amount of motion artifacts, by detecting the static cardiac time phase, which varies depending on the heart beat of the patient.

Applicant simply does not find teaching or suggestion in the cited art, however, of detecting a static cardiac time phase with a small amount of motion artifacts in a predetermined portion of the subject based on heartbeat information acquired in association with the projection data, and generating a tomographic image by reconstructing projection data corresponding to the detected static cardiac time phase, as provided by the subject matter of claim 1.

Independent claim 15 is patentably distinct from the cited art for at least similar reasons.

Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claims 1 and 15, and the claims depending therefrom, are patentable over the cited art.

In view of the remarks hereinabove, Applicant submits that the application is now in condition for allowance, and earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper

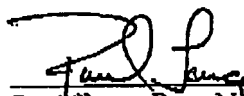
Hiroto KOBUKUN et al. 10/501,121  
Page 18

Dkt. 1141/72716

should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that are required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,



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# **EXHIBIT A**

to  
**AMENDMENT**  
(Serial No. 10/501,121)